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ADDRESS TO THE BIOLOGICAL SECTION OF THE BRITISH ASSOCIATION.*

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SIXTEEN years ago, at the meeting of the British Association in Bath, the duty which I am endeavouring to discharge to-day was entrusted to my predecessor and old friend, the late Dr. John Edward Gray. In the address which he then delivered before this section, he spoke on "Museums, their Use and Improvement," and he who had devoted a whole lifetime to the formation and management of one of the greatest zoological collections in the world, was well qualified to give an opinion and advice on this subject. Indeed, when I read now what he then insisted on as a necessary change in the system of Museums, I feel compelled to pay a passing tribute to his memory. Zoology, Geology, Botany were to him not distinct and independent studies; the views advanced by a Lamarck, by a Treviranus,—*viz.*, that our knowledge of these sciences would remain fragmentary and one-sided as long as they were not studied in their mutual relations,—found in him one of the earliest advocates in this country. Against all opposition he tried to unite the Zoological and Palæontological collections in the British Museum, giving up this attempt only after having convinced himself of the impracticability of the scheme; and he readily joined the band of men who demanded that a Museum should be not merely a repository for the benefit of the professed student and specialist, but serve in an equal measure for the recreation of the whole mass of the people and for their instruction in the principles of Biology. This was the spirit in which he worked, and in the last years of his life he had the satisfaction of being able to say that there was no other collection in existence more accessible and more extensively used than the one under his charge.

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* Delivered at Swansea, August, 1880.

I am encouraged to return to-day to the same subject, because I have daily the opportunity of observing that the public more and more comprehend the use of Museums, and that they appreciate any real improvements, however slight. Paragraphs, leaders, articles published in the public journals and periodicals, references made in speeches or addresses, questions put in the Houses of Parliament whenever an opportunity offers—all testify that the progress of Museums is watched with interest. Not long ago a Royal Commission entered deeply and minutely into the subject, and elicited a mass of evidence and information invaluable in itself, though you may differ from some of the conclusions and views expressed in their final report. Biological Science has made rapid strides: not only do we begin to understand better the relations of the varieties of living forms to each other, but the number of varieties themselves that have been made known has also been increased beyond all expectation, and the old repositories have everywhere been found too narrow to house the discoveries of the last forty years. Therefore you find that the United States, Austria, Prussia and Saxony, Denmark and Holland, France and Great Britain have erected, or are building anew, their National Museums, not to mention the numerous smaller museums which are more or less exclusively devoted to some branch of Biological Science.

The purposes for which Museums are formed are threefold: (1) to diffuse instruction among, and offer rational amusement to, the mass of the people; (2) to aid in the elementary study of Biology; and (3) to supply the professed student of Biology or the specialist with as complete materials for his scientific researches as can be obtained, and to preserve for future generations the materials on which those researches have been based. Although every museum has, as it were, a physiognomy of its own, differing from the others in the degree in which it fulfils one or two or all three of those objects, we may divide museums into three classes, *viz.*: (1) National; (2) Provincial; and (3) Strictly Educational Museums: a mode of division which may give to those of this assembly who are not biologists an idea of what we mean by the term "species." The three kinds pass into each other, and there may be hybrids between them.

The museum of the third class, the Strictly Educational institutions, we find established chiefly in connection with universities, colleges, medical and science schools. Its principal object is to supply the materials for teaching and studying the elements and general outlines of Biology; it supplements, and is the most necessary help for, oral and practical instruction, which always ought to be combined with this kind of museum. The conservation of objects is subservient to their immediate utility and unrestricted accessibility to the student. The collection is best limited to a selection of representatives of the various groups or "types," arranged in strictly systematic order, and associated with preparations of such parts of their organisation as are most characteristic of the group. Collections of this kind I have seen arranged with the greatest ingenuity, furnishing the student with a series of demonstrations which correspond to the plan followed in some elementary text-book. This, however, is not sufficient for practical instruction; besides the exhibited permanent series, a stock of well-preserved specimens should be kept for the express purpose of allowing the student to practise dissection and the method of independent examination; and in this latter I am inclined to include the method of determining to what order, family, genus or species any given object should be referred. By such practice alone can the student learn to understand the relative value of taxonomic characters and acquire the elementary knowledge indispensable for him in the future. Finally, in the educational museum should be formed a series of all the animals and plants which are of economic value, or otherwise of importance to man. The proposal to unite living and extinct forms in one series, which has been urged by eminent men with such excellent reasons, might be tried in the educational museum with great advantage to the student, as the principal objections that are brought forward against this plan being carried out in larger collections, do not apply here.

A museum which offers to the teacher and student the materials mentioned fulfils its object; its formation does not require either a long time or heavy expense; but the majority of these institutions outgrow in time their original limits in one or the other direction; and if such additions do not interfere with the general arrangement of the museum, they neither destroy its character nor do they add to its value as a strictly educational institution.

The principal aim of a Provincial Museum ought, in my opinion, to be popular instruction. I do not mean that it should be merely a place for mild amusement and recreation; but that it should rank equal with all similar institutions destined to spread knowledge and cultivate taste among the people. To attain this aim it should contain an arranged series of well-preserved specimens, representing as many of the remarkable types of living forms as are obtainable; a series of useful, as well as noxious, plants and animals; of economic products obtained from the animal and vegetable kingdoms; and last, but not least, a complete and accurately named series of the flora and fauna of the neighbourhood. The majority of Provincial Museums with which I am acquainted are far from coming up to this ideal. One of the first principles by which the curator of such a museum should be guided is to admit into his collection no specimen unless it be well mounted and a fair representation of its species. He has not the excuse of his colleague in charge of a large museum, who has to retain those monsters which are literally his *bêtes-noires*, viz., specimens to which a history is attached, and the removal of which would sooner or later be resented by some of his fellow-labourers. The only too frequent presence of such badly-mounted specimens in Provincial Museums is not always the fault of the curator. The slender means with which he is provided are generally insufficient to encourage taxidermists to bestow the necessary amount of skill and time on their work. Besides, taxidermy is an art which depends as much on natural gift as drawing or modelling; and so long as we are obliged to be satisfied with receiving into our collections mediocre specimens, mediocre stuffers will take up taxidermy as a trade without there being one among them who is naturally qualified for it.

The direct benefit of a complete collection of the flora and fauna of the district in which the Provincial Museum is situated, is obvious, and cannot be exaggerated. The pursuit of collecting and studying natural-history objects gives to the persons who are inclined to devote their leisure hours to it a beneficial training for whatever their real calling in life may be: they acquire a sense of order and method; they develop their gift of observation; they are stimulated to healthy exercise. Nothing encourages them in this pursuit more than a well-named and easily accessible collection in their own native town, upon which they can fall back as a pattern and an aid for their own. This local collection ought to be always arranged and named according to the plan and nomenclature adopted in one of those numerous monographs of the British Fauna and Flora in which this country excels; and I consider its formation in every Provincial Museum to be of higher importance than a collection of foreign objects.

The majority of Provincial Museums contain not only biological collections, but very properly, also, collections of art and literature. It is no part of my task to speak of the latter; but before I proceed to the next part of my address I must say that nothing could more strikingly prove the growing desire of the people for instruction than the erection of the numerous Free Libraries and Museums now spread over the country. The healthier their rivalry the safer their growth will be, especially if they avoid depending on aid from the State, or placing themselves in the hands of a responsible minister; if they remain what they are—municipal institutions, the children and pride of their own province.

However great, however large a country or a nation may be, it can have, in reality, only one National Museum truly deserving of the name. Yours is the British Museum; those of Scotland and Ireland can never reach the same degree of completeness, though there is no one who wishes more heartily than I do that they may approach it as closely as conditions permit. The most prominent events in the recent history of the British Museum (to which I must confine the remainder of my remarks) are well known to the majority of those present:—that the question either of enlarging the present building at Bloomsbury, or of erecting another at South Kensington for the collections of Natural History, was fully discussed for years in its various aspects; that finally a Select Committee of the House of Commons reported in favour of the expediency of the former plan; that the Standing Committee of the Trustees, than whom there is no one better qualified to give an opinion, took the same view; and that, nevertheless, the Government of the time decided upon severing the collections, and locating the Natural History in a separate building, as the more economical plan.

The building was finished this year at a cost of £400,000, exclusive of the amount paid for the ground on which it is erected. It is built in the Romanesque, or round-arched gothic style, terra-cotta being almost exclusively employed in its construction. It consists of a basement, ground-floor, and two storeys, and is divided into a central portion, and a right and left wing. Its principal (southern) façade is 675 feet long. As you enter the portal you come into a cathedral-like hall, called the "Index Museum," 120 feet long, 97 feet wide, and 68 feet high; behind this there is a large side-lighted room for the British Fauna. On each side of the hall there is a side-lighted gallery, each 278 feet long by 50 feet in width; seven other galleries of various widths, and therefore adapted for various exhibitions, join at right angles the long gallery of the ground-floor. The first and second storeys are occupied by galleries similar to the main gallery of the ground-floor.

The collections are distributed in this building thus:—The western wing is occupied by Zoology, the eastern by the three other departments, *viz.*, the ground-floor by Geology, the first-floor gallery by Mineralogy, and the second-floor gallery by Botany. The central portion is, as mentioned above, divided into the room for British Zoology and into the "Index Museum," that is, "an apartment devoted to specimens selected to show the type-characters of the principal groups of organized beings." The basement consists of a number of spacious, well-lit rooms, well adapted for carrying on the different kinds of work in connection with such large collections.

There is no doubt that the building fulfils the principal condition for which it was erected, *viz.*, space for the collections. The Zoological collections gain more than twice as much space as they had in the old building, the Geological and Mineralogical about thrice, and the Botanical more than four times. This increase of space will enable the keeper of the last-named department to bring the collections correlated with each other into close proximity, and to prepare a much greater number of objects for exhibition than was possible hitherto. The Mineralogical Department, already so admirably arranged in the old building, has now been supplied with the space requisite for a collection of rocks, with a laboratory and goniometrical room. Geology is now in a position to exhibit a great part of the *Invertebrata*, which hitherto had to be deposited in private studies, besides devoting one or two of the new galleries to a stratigraphical series. On the Zoological side we have been great gainers, not with regard to the proportion of space, but inasmuch as we were more impeded by the crowded state of our collections than any of the other departments: we are enabled to avoid the exhibition of heterogeneous objects in the same room or gallery: mammals, birds, reptiles, fishes, mollusks, insects, echinoderms, corals, and sponges have each a smaller or larger gallery to themselves. With the exception of the specimens preserved in spirits, the study-series can be located in contiguity with, or at least close vicinity to, the exhibition series. There is ample and convenient accommodation for students; besides a spacious room, centrally situated, and arranged for the exclusive use of students, this class of visitors can be accommodated at four other different localities immediately adjoining the several branches of the collection.

I believe that some of the members of the British Association will feel somewhat disappointed that the Zoological and Botanical collections on the one hand, and the Palæontological on the other, continue to be kept distinct. Who will, who can, doubt that the two branches of Biological science would be immensely benefited by being studied in their natural mutual relations? and that Palæontology, more especially, would have made surer progress if its study had been conducted with more direct application to the series of living forms? But to study the series of extinct and living forms in their natural connection is one thing, and to incorporate in a museum the collection of fossil with that of recent forms is another. The latter proposal, so excellent in theory, would offer in its practical execution so many and insuperable difficulties that we may well hesitate before we recommend the experiment to be tried in so large a collection as the British Museum. I have mentioned above that in a small collection such an arrangement may be feasible to a certain degree; but in a large collection you cannot place skins, bones, spirit-preparations, and stones in the same room, or perhaps in the same case, exposing them to the same conditions of light and temperature, without injuring either the one or the other. Each kind of those objects requires for its preservation special considerations and special manipulations; and by representing them in each of the several departments you would have to double your staff of skilled manipulators, with their apparatus, which means multiplying your expenses. Departmental administration generally, and especially the system of acquisition by purchase or exchange, would become extremely complicated, and could not be carried on without a considerably greater expenditure in time and money. Thus, even if the old departmental division were abandoned for one corresponding to the principal classes of the animal kingdom, each of the new departments would still continue to keep, for consideration of conservation, those different kinds of objects, at least locally, separate. The necessity of this has been so much felt in the British Museum, that the Trustees resolved to store the spirit-specimens at South Kensington, in a building specially adapted for the purpose, and separated from the main building, as the accumulation of many thousand gallons of spirits is a source of danger which not many years ago threatened the destruction of a portion of the present building in Bloomsbury.

I could never see that by the juxtaposition of extinct and living animals the student would obtain particular facilities for study, or that the general public would derive greater benefit than they may obtain, if so inclined, from one of the numerous popular books; they would not be much the wiser if the *Archæopteryx* were placed in a passage leading from the reptile- to the bird-gallery. And it certainly cannot be said that the separation of living and extinct organisms, so universally adopted in the old museums, has been a hindrance to the progress of our knowledge of the development of the organic world. This knowledge originated and advanced in spite of museums-arrangements. What lies at the bottom of the desire for such a change amounts, in reality, to this, that museums should be the practical exponents of the principle that zoologists and botanists should not be satisfied with the study of the recent fauna and flora, and that palæontologists should not begin their studies or carry on their researches without due and full reference to living forms. To this principle every biologist will most heartily subscribe; but the local separation of the various collections in the British Museum will not offer any obstacles whatever to its being carried out.

The student can take the specimens (if not too bulky) from one department to the other; he may examine them in the gallery without interference on the part of the public; or he may have all brought to a private study, and, in fact, be in the same position with regard to the use of the collections as those who have charge of them. A plan which has been already initiated in the old building will probably be further developed in the new, *viz.*, to distribute in the palæontological series such examples of important living types as will aid the visitor in comprehending the nature and affinities of the creatures of which he sees only the fragmentary remains.

With regard to the further arrangement of the collections in the new building, it has long been understood that the exhibition of all the species, or even the majority of them, is a mistake; and that, therefore, two series of specimens should be formed, *viz.*, one for the purposes of advanced scientific study—the study-series, and the other comprising specimens illustrative of the leading points both of popular and scientific interest; this latter—the exhibition-series—being intended to supply the requirements of the beginner in the study of natural history, and of the public. As the zoological collections are better adapted for exhibition than the others, the following remarks refer principally to them. The bulk of our present exhibition-series is the growth of many years, and to convert it into one which fulfils its proper purpose is a gradual and slow process; nor can it be expected to reveal its character until it has been removed into the new locality. The exhibition will be probably found more liberal than may be deemed necessary by some of my fellow-labourers; but if a visitor should, on leaving the galleries, "take nothing with him but sore feet, a bad headache, and a general idea that the animal kingdom is a mighty maze without plan," I should be inclined to believe that this state of bodily and mental prostration is the visitor's, and not the curator's fault. The very fact that the exhibition-series is intended for a great variety of people renders it necessary to make a liberal selection of specimens, and I simply follow the principle of placing in it all those objects which, in my opinion, the public can understand and appreciate, and which therefore must contribute towards instruction. The public would receive but an inadequate return for keeping up a National Museum if they were shown, for instance, a dozen so-called "types" of the family of parrots or humming-birds; they require a good many more to see what Nature can produce in splendour and variation of colour, in grotesqueness of form; or to learn that whilst one of these groups of birds is spread all over the countries of the tropical zone, the other is limited to a portion of a single continent. To render such an exhibition thoroughly useful two additional helps are required, *viz.*, a complete system of explanatory labels, and a popularly-written and well-illustrated handbook, which should not only serve as a guide to the more important and interesting specimens, but give a systematic outline of the all-wise plan which we endeavour to trace in God's creation.

There is one part of the Museum which I intend to treat in a different manner from the rest, and that is the collection of British animals. For the same reasons for which I have in a former part of this address insisted on District Faunas being fully represented in Provincial Museums, I consider a complete exhibition of the British Fauna to be one of the most important objects of the National Museum. Its formation is, strange as it may appear to many of you, still a desideratum, and a task which will occupy many years. It will not be easy (especially when you are in danger of infringing an Act of Parliament) to form a complete series of British birds showing their changes of plumage, their young, their eggs, their mode of nidification; it is a long work to collect the larvæ and chrysalides of insects, and to mount the caterpillars with their food-plants; and we shall require the co-operation of many a member of the British Association when we extend the collection to the marine animals and their metamorphoses. But all the trouble, time, and labour spent will be amply repaid by the direct benefits which all classes will derive from such a complete British collection.

My time is becoming short, and yet I find that I am far from having completed the task I had set myself. Therefore let me briefly refer only to a few points which of late have much agitated those who feel a direct or indirect interest in the progress of the National Museum.

In the first place we must feel deeply concerned in everything relating to the conservation of the collections. If the objects could speak to you as they do to those familiar with their history, many of them would tell you of the long hours of patient inquiry spent upon them; many might point with pride at the long pages written about them—alas! not always with the even temper which renders the study of natural science a delight and a blessing; others would remind you of having been objects of your wonder when you saw them depicted in scientific books, or in some household work; whilst not a few could tell you pitiful tales of the enthusiastic collector who, braving the dangers of a foreign climate, sacrificed health or life to his favourite pursuit. Collections thus obtained, thus cherished, representing the labours of thousands of men, and intended to instruct hundreds of thousands, are worth preserving, displaying, and cultivating. No cost has been spared in housing them; let no cost be spared in providing proper fittings to receive them, a sufficient staff to look after them, and the necessary books to study them.

What we chiefly require in a well-constructed exhibition-case is that it should be as perfectly dust-proof as possible, that it should lock well and easily, and yet that it should be of a light structure. Everyone who has gone through a gallery of our old-fashioned museums must have noticed how much those broad longitudinal and transverse bars of the wooden frame of the front of a case interfere with the inspection of the objects behind them, hiding a head here, a tail there, or cutting an animal into two more or less unequal portions. Ill-constructed cases have brought zoölogical collections as much into bad repute as bad stuffers; and if it be thought that a pound could be saved in the construction of a case, that pound will probably entail a permanent expense of a pound a year. Now, all the requisites of a good exhibition case can be obtained by using metal wherever it can be substituted for wood; and, although its use is more expensive than that of wood, you will join with me in the hope that no mistaken desire of economy will prevail now, as the time has arrived to furnish our priceless collections with adequate fittings.

Probably all of those present are aware that the formation of a Natural History Library has been urged almost from the very first day on which the removal of the Natural History collections to South Kensington was proposed. But the cost and extent of such a library have been very variously estimated. And I am sorry to say that it is, I believe, owing to expressions of opinion on the part of those who ought to know better, that the cost of this library was considerably underrated when the removal to South Kensington was determined upon. We cannot blame the

Government that they hesitated for years before they acceded to the pressing representations of the Trustees of the British Museum, to begin with its formation, when they were told by naturalists that the cost of such a library would be something between £10,000 and £20,000. I could hardly believe my eyes when I read only a few weeks ago, in the leader of a weekly periodical specially devoted to science, that "had the Trustees put aside a thousand a year for this purpose when it was first determined to remove the Natural History collections ten years ago, there would have been by this time in existence a library fully adequate to the purpose." The writer must have either a very poor idea of the objects and work of a National Museum, or an imperfect knowledge of the extent of the literature of Natural History. £10,000 might suffice to purchase a good ornithological library, and £1000 would purchase the annual additions to all the various branches of natural history; but the former sum would be much too small if the purchase of those works only were intended which are required for the technical work of naming animals, plants, fossils, and minerals. A better calculation was made by the Select Committee of the House of Commons on the British Museum in 1860, who stated that the formation of a Natural History Library would cost about £30,000 at the present time (1860). Considering that twenty years have elapsed since, and that this part of the literature has shown year by year a steady increase, we must put our estimate considerably higher than the writer of that article.

With the aid of some of my friends who know, from their daily occupation, the market value of Natural History works, I made a calculation some years ago, and we came to the conclusion that a complete Natural History Library will cost £70,000; and, unpalatable as this statement may be to those who have advocated the removal of the Natural History collections, and therefore must be held responsible for this concomitant expense, it will be found to be true. It will be satisfactory to you to learn that the Government have at last sanctioned the expenditure of half that amount.

Now, in my opinion, such a library formed in connection with the National Museum should not be reserved for the use of the officials, but I would recommend that it should be accessible to the general class of students in the same manner as any other part of the collections. It is for this reason that I wish to see it rendered as perfect as possible with respect to the older publications (many of which are getting scarcer year by year), as well as to the most recent. Whether or not a similarly perfect collection of Natural History books exists in some other place in London, is another question with which I am not concerned. The general Natural Library evidently ought to contain a perfect set of books on Natural History, irrespective of other claims; but to have Natural History collections in one place, and the books relating to them in another, miles away, will produce as much inconvenience as is experienced by the person who puts the powder into one barrel of his gun and the shot into the other.

If the British Museum (for the collections will remain united under this old time-honoured name, though locally separated) continues to receive that support from the Government to which it is justly entitled, I have no doubt that it will not only fulfil all the aims of a National Collection, but that it will be also able to give to the kindred provincial institutions the aid which has recently been claimed on their behalf. Under an Act of Parliament which was passed in the previous Session, and which empowers the Trustees to part with duplicate specimens, several of those Museums have already received collections of zoological objects. But I consider it my duty to caution those who are in charge of those Museums to be careful as to the manner in which they avail themselves of this opportunity. Well-preserved duplicates of the rarer and more valuable vertebrate animals are very scarce in the British Museum, the funds for purchase being much too small to permit the acquisition of duplicates. What we possess of this kind of duplicates are generally deteriorated specimens, and therefore ought not to be received by Provincial Museums. On the other hand, our invertebrate series, especially of Mollusks and Insects, will always offer a certain number of well-preserved duplicate specimens and a sufficient inducement for Provincial Museums to select their desiderata.

It has been suggested that, as the British Museum has correspondents and collectors in almost every part of the globe, and has therefore greater facilities for obtaining specimens than any other institution, it should systematically acquire duplicates, and form a central repository, from which Provincial Museums could draw their supplies. If the necessary funds to carry out this scheme were granted, I cannot see any objection to it on the part of the British Museum, which, on the contrary, would probably derive some benefit. But there is one, and in my opinion a very serious, objection, *viz.*, that this scheme would open the door to the employment of curators of inferior qualifications; it would relieve the curator of a Provincial Museum of an important part of his duty, *viz.*, to study for himself the requirements of his Museum, the means of meeting them, and to become well acquainted with the objects themselves. A curator who has to be satisfied with the mechanical work of displaying and preserving objects acquired, prepared, and named for him by others, takes less interest in the progress of his Museum than he whose duty it would be to *form* a collection; he is not the person in whose charge the Museum will flourish.

In speaking of the claims of Provincial Museums on the National Museum, the kindred Colonial institutions should not be forgotten. We owe to them much of our knowledge of the Natural History of the Colonies; they are the repositories of the collections of the temporary and permanent surveys which have been instituted in connection with them, and they have concentrated and preserved the results of manifold individual efforts which otherwise most likely would have been lost to Science. The British Museum has derived great benefit from the friendly relations which we have kept up with them, and therefore they are deserving of all the aid which we can possibly give them, and which may lessen the peculiar difficulties under which they labour in consequence of their distance from Europe.

I am painfully aware that in the remarks which I have had the honour of making before you, I have tried the patience of some, and not satisfied the expectations of others. But so much I may claim:—that the views which I have expressed before you as my own are the results of many years' experience, and therefore should be worthy of your consideration; and that I am guided by no other desire than that of seeing the Museums in this country taking their proper place in regard to Biology, and as one of the most important aids in the instruction of the people.

NOTES ON THE FRESH-WATER FISHES OF INDIA.

By Francis Day, F.L.S.

The fishes inhabiting the fresh waters of India, Burma and Ceylon may be divided into those which enter from the sea for breeding or for predatory purposes, and those which pass their lives more or less without descending to the salt water. Of the first class I do not propose giving any detailed description beyond a casual remark when the breeding of fish, or the fisheries, come under review.

An exhaustive account of all the strictly fresh-water forms would doubtless be interesting scientifically, but hardly so to the fisherman or general reader; consequently I shall restrict myself to observing that the fisheries above alluded to contain about 369 species, appertaining to eighty-seven genera. Of the spiny-rayed, or *Acanthopterygian* order, we have nineteen genera, the members of which are most numerous in the maritime districts and deltas of large rivers, while their numbers decrease as we proceed further inland. Few are of much economic importance, if we except the Common Goby, Spined Eels (*Mastacembelidæ*), the Snake-headed Walking-fishes (*Ophiocephalidæ*), and the Climbing Perch and its allies. Of the Sheat-fish, or scaleless Siluroids, we have twenty-six genera; the mouths of these are provided with sensitive feelers, which, serving as organs of touch, assist them while seeking their prey in turbid waters. All that are of sufficient size are esteemed as food, although, owing to their propensity for consuming unsavoury substances, their wholesomeness appears at times to be questionable. The next three genera, *Belone* (Gar-pike), *Cypronodon* and *Haplochilus*, are of but little value; but the thirty-five genera of Carps and Roaches are of the greatest possible consequence, affording a large amount of food to the population of the country. The remaining four genera, consisting of the curiously flattened *Notopterus* and three forms of Eels, are of but little mercantile importance.

How the reproduction of these fishes is carried on becomes a most necessary subject for investigation, in briefly considering which we might inquire, what migrations they undertake for this purpose? whether the parents are monogamous, polygamous, or annuals, dying after the reproduction of their species? the time of year when spawning occurs? whether this is deleterious to the parent? the size of the eggs, their colour; whether they float or sink, are deposited in running or stagnant waters? whether they are covered or left uncovered in their nests? whether the male carries them about or protects them? and whether their germination can be retarded by artificial means or natural causes, as by the action of cold or their immersion in mud?

That anadromous forms, as the Salmon or Shad of Europe, or the Shad (*Clupea palasah*) of India, migrate from the sea to the fresh waters to deposit their eggs in localities most suitable for their reception, is well known. If we examine into the migration of Indian fishes for breeding purposes we find this takes place with three classes, *viz.*—(1) anadromous forms from the sea to the fresh waters, as already referred to; (2) species which may be considered to pertain to the mountains, or else deposit their ova in the rivers of the hills; (3) those which are restricted to the plains, but which likewise undertake certain changes of locality at these periods.

Of the migratory hill fishes the various forms of large Barbels, termed "Mahaseers," furnish good examples. In the Himalayas they ascend the main rivers, but turn into the side-streams to breed; while on the less elevated Neilgherry mountains, in the Madras Presidency, the same phenomenon occurs, but with this difference, that they deposit their ova in the main streams, because these are small, owing perhaps to their never being replenished with snow-water. Occasionally the fish are too large to ascend these mountain rivers, when it would appear they breed at the bases of the hills; whether it is from the offspring of these that this genus has extended through the plains it is not my present purpose to inquire. When the rivers commence being in flood adult fish are able to ascend to feeding grounds previously inaccessible to them. Having spawned, they keep dropping gently down stream, during which time the amount of water is diminishing; thus the ova, when hatched, are completely cut off from the locality where the parent fish reside, precluding their making a meal of them. The fry, therefore, have the heads of the rivers to themselves in perfect security, and each torrent becomes transformed into a small stream intersected by pools, where they can remain until the next rains enable them to descend to the larger rivers.

Of the migratory fishes of the plains many forms of Carp may be observed, more particularly where impassable weirs exist: here they may be seen attempting to jump over the obstruction; and so common is this occurrence that the natives of India hang baskets, cloths, even native cots turned upside down, or anything equally suitable, over the sides of the weirs, and into this the fish fall.

In Asiatic waters both monogamous and polygamous forms exist, while other phenomena as to breeding deserve attention. The walking or snake-headed fishes, *Ophiocephalidæ*, of India, and other amphibious genera, are perhaps the best known of monogamous fishes; some of them reside in ponds, others prefer rivers, where they take up their residence in deserted holes which they find in the banks. The pond species delight in lying at the grassy margins where the water is not sufficiently deep to cover them; and here they are able to respire atmospheric air direct. The Striped Walking-fish constructs a nest with its tail among the vegetation, and bites off the ends of the water-weeds; here the ova are deposited, the male keeping guard; but should he be killed or captured the vacant post is filled by his partner. The Hissar, *Callichthys*, of South America, is likewise monogamous, constructing a nest, which is also defended. The majority of fishes are unquestionably polygamous, as has been repeatedly observed, perhaps as distinctly in the case of the Salmon as any other species in a wild state, as well as Sticklebacks resident in aquaria; while doubtless fishes which migrate in shoals for breeding purposes, as the Mackarel, Herring, and some forms of Carp, are all polygamous. Warington considered that when the Stickleback had propagated its species it died; and Collet has given us an account of how some globoid fishes, *Latrunculus pellucidus*, spawn in August, and when this has been accomplished they disappear, becoming, as he supposes, extinct—being, in fact, annuals among animals.

The time of year at which spawning is effected varies with the locality and the family of fish, and depends also on the temperature of the water and other local causes, while there are some fishes which only breed once a year, others more frequently. Some fishes do not appear to feed during the season of depositing their spawn, as the Salmon, the Shad, and the siluroid *Ariinæ*. In this country the Twaite Shad leaves the sea at the end of May or commencement of June, ascending some of our largest rivers to spawn. In India another Shad—termed "Pulla" in the Indus, "Ulum" by the Tamils, "Sable-fish" by the Madrassees, "Palasah" by the Telingis, "Hilsa" or "Ilisha" in Bengal, "Nga-tha-louk" by the Burmese—is very similar in many respects to the British species, while it is also anadromous, breeding in rivers as already described. In Sind they ascend the Indus in February to spawn, descending in September. In the Cauvery, in Madras, they pass up when the first burst of the June monsoon fills the river, and they continue doing so for the succeeding four months. In the Kistna, which has a far greater velocity, but, similarly to the Cauvery, is filled in June, they defer their ascent until September, but it is not until the end of the month, or commencement of October, when the river is subsiding and its velocity decreasing, that the majority arrive; whereas in the neighbouring river, the Godavery, in which the current is less rapid, these fishes ascend earlier to spawn, being most numerous from July to September. In the Hooghly they continue ascending throughout the June monsoon, and many are found still in roe in September. The main bodies of these fish ascend the large rivers of India and Burma generally when the June monsoon commences, but not always at the same period, the ascent at times being dependent upon the rapidity of the current and other causes. That it is not solely due to the presence of rain-water flooding the rivers is evident, because those of the Indus and Irrawaddi are mainly caused by melting snows at this period; and in the latter river these fishes push on to Upper Burma, to which country the monsoon scarcely extends, but where the inundations are due to snow-floods. The cause of the majority of fishes at these various periods ascending the different rivers to spawn may be due to their having been bred there, while inherited instinct causes them to select the most suitable times, when the shallows are covered with water and ascent is rendered practicable. It has been remarked that occasionally a very cold winter retards the breeding of the Salmon and their allies; and Dr. John Davy observed, at Eisenhartz, that he obtained Charr just about to spawn at the end of May, while in England they spawn in the winter, and he considers this must depend upon the weather. "If," says that excellent observer, "summer is the spawning time of the Charr and Trout in the lakes of Southern Austria, it is connected with, or owing to, the water at that time being of the temperature best fitted for the purpose, most of these lakes being fed by mountain streams, frozen in the winter, and full in summer from the melting of the snow." The salmonoid Grayling spawns in April or May; but without entering more minutely into this question, it is evident that fishes of the same family, genus, or even species may spawn at different periods, owing to local or climatic causes. There are also other fishes which deposit their ova twice yearly, if not more frequently; these are generally fresh-water forms, and not rare, especially in tropical countries, as, for example, the Walking-fishes.

To the question, whether the effect of spawning has any deleterious effect upon the parent fishes? two replies may be given, as in some cases it renders their flesh unwholesome, while in others it does not cause their character as to food to be altered. The Shad in the East is excellent eating up to the period when it has deposited its eggs, subsequent to which it becomes thin, flabby, and positively unwholesome; the Salmon is then in a similarly unhealthy lean and lank condition, which renders it unsuitable for the table. Fresh-water fishes that deposit a smaller number of eggs, or perhaps do so more gradually, or twice at least during the year, are not so deleteriously affected by breeding, this condition being mostly restricted to the anadromous forms.

The size of the eggs, their colour, and whether deposited in ponds or in the sea, are likewise questions to be determined. The species which produce the greatest number of eggs are often those which live in large communities and spawn once a year. Thus, in the Codfish, one of 20 ℔s. had 4,872,000, another of 11½ ℔s. weight, 1,800,000, while in a third instance, in which the roe weighed 7¾ ℔s., there were 7,546,400 eggs. In an Indian Shad I found 1,023,645 eggs; a Turbot of 8 ℔s., 385,200; a Brill of 4 ℔s., 239,775; a Flounder of 1½ ℔., 1,357,400; a Sole of 1 ℔., 134,466. But other species likewise have numerous eggs. I observed 410,500 in a Barbel (*Barbus sarana*) in India; a Tench of 2½ ℔s. contained, according to Harmer, 383,252. On the other hand, some fishes have large eggs, as the Salmonoids, some Sheat-fishes, and a few Indian Carps (*Barilius*). The editor, when reporting some of Herr Malmgren's exceedingly interesting investigations upon *Salmonidæ*, in the 'Zoological Record' for 1864, says of the eggs of members of the Salmon family:—"The size of the ova is not invariably the same in individuals of whatever size, but, as far as our experience reaches, is even often characteristic of the species of a genus." Dr. John Davy, in 1852, published the result of his accurate investigations upon this point, for which purpose he selected the Charr. He says of the ova:—"Those I have examined I have found to vary in diameter from 0·16 to 0·18 and 0·20 of an inch, and in weight (after removal of the adhering moisture by wiping), from 0·7 to 1· grain each." I have personally measured the size of fourteen ova taken from a single example of an Indian siluroid (*Osteogeneiosus*); they were 0·4 to 0·5 of an inch in diameter, thus showing variations in the size of the ova from a single fish results confirming the investigations of Davy in a Charr. If the size can thus vary in the eggs from one specimen, it does not seem remarkable that it may do so more widely in nearly related genera; thus, the Smelt (*Osmerus*), belonging to the Salmon family, has by no means large ova, for in two examples, each weighing two ounces, there were found in one 38,278 eggs, and in the other 36,652 eggs. Davy counted 1230 ova in a Charr, while in the Salmon and Trout it has been observed that they carry somewhere about 1000 eggs to each pound of weight. Such a proportion, however, does not apply to those which are less than one pound, and even in larger fish it is subject to considerable variation. In fishes that spawn at least twice a year, and likewise protect their young, the number of eggs is less than what generally obtains in other genera. Thus in a Walking-fish (*Ophiocephalus*) I found 4700.

As to the colour of fish-eggs, they are very various; in some fresh-water siluroids they are of a light pea-green, as I have observed in the Indian Scorpion-fish, and as also occurs in *Silurus glanis*, while in the Salmon and Trout, and Grayling, they may be coral-red, yellow, or pure white. As to the places where fish deposit their eggs, these are exceedingly various, as might be anticipated, because some sink in the water while others float. Professor Sars found the ova of several of our best-known fishes floating on the surface of the sea, where they remain during the whole period of their development; among such as he was able to hatch out were those of the Cod, Haddock, Mackarel, Plaice, Gar-fish, and a Gurnard. This fact is interesting because it shows that trawl-nets could not occasion injury to these eggs, whatever they might do to the young. On the contrary, the eggs of the Herring sink, as do likewise those of most fresh-water fishes. Anadromous fishes apparently deposit their spawn in running water, but in different ways; the native fishermen in India consider those of the Shad float, whereas we are aware those of the Salmon family sink; but even among these fishes we perceive a great difference in treatment of the eggs. The Smelt, says Parnell, "shed their spawn in immense quantities about two miles below Stirling Bridge, when, at that time, every stone, plank, and post appear to be covered with their yellowish ova." The Grayling deposit their roe on the gravel, while the Salmon and Trout cover their ova, which are furnished with a tough and elastic outer covering, with sand and gravel. Other fresh-water forms spawn in muddy ponds or slowly-flowing rivers, where the eggs of the *Salmonidæ*, as a rule, would never arrive at maturity. Some fish-eggs, as already observed, float upon the surface of the water. The eggs of the Gar-fish, observes Mr. Dunn, are "found to be covered with flexible hooks, which, without any help from the parent fish, fasten themselves to any floating marine object." In fresh waters the eggs of fishes may remain at the bottom, either covered or uncovered.

(To be continued.)

THE WILD BIRDS PROTECTION ACT, 1880.

[Following the precedent occasioned by the passing of the Wild Fowl Preservation Act, 1876, and in compliance with the wishes of several correspondents who desire to be informed how the law at present stands on this subject, we print the Act which has recently received the royal assent, and which will come into operation on the 1st January next.

The general effect of this, briefly speaking, is as follows:—The Sea Birds Act, 1869, the Wild Birds Act, 1872, and the Wild Fowl Act, 1876, are all repealed, and a close time is provided for *all* birds between the 1st March and the 1st August. Those species which are mentioned in the Schedule may not be killed during the close time, under a penalty not exceeding **£1**; those *not* mentioned in the Schedule may not be killed under a penalty (for a second offence) of a sum not exceeding 5*s.* and costs.

In the case of the latter class, the Act does not apply to the owner or occupier of the land on which any of these birds may be killed, or to any person duly authorised by owner or occupier. In other words, if any owner or occupier deems it desirable to keep down Sparrowhawks, Jays, Hooded Crows, Wood Pigeons, or any other bird which he may consider destructive, he may destroy them on his own land, or authorise some one else to do so.

The Home Secretary still has power to vary the close time upon application of justices at Quarter Sessions, as he was formerly enabled to do by the Act of 1876, now repealed.—Ed.]

An Act to amend the Laws relating to the Protection of Wild Birds.

[43 & 44 Vict., c. 35, 7th September, 1880.]

Whereas it is expedient to provide for the protection of wild birds of the United Kingdom during the breeding season:

Be it therefore enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

1. This Act may for all purposes be cited as the Wild Birds Protection Act, 1880.

2. The words "wild birds" shall for all the purposes of this Act be deemed to mean all wild birds. The word "sheriff" shall include steward and also sheriff substitute and steward substitute.

3. Any person who between the first day of March and the first day of August in any year after the passing of this Act shall knowingly and wilfully shoot or attempt to shoot, or shall use any boat for the purpose of shooting or causing to be shot, any wild bird, or shall use any lime, trap, snare, net, or other instrument for the purpose of taking any wild bird, or shall expose or offer for sale, or shall have in his control or possession after the fifteenth day of March, any wild bird recently killed or taken, shall, on conviction of any such offence before any two justices of the peace in England and Wales or Ireland, or before the sheriff in Scotland, in the case of any wild bird which is included in the schedule hereunto annexed, forfeit and pay for every such bird in respect of which an offence has been committed a sum not exceeding one pound, and, in the case of any other wild bird, shall for a first offence be reprimanded and discharged on payment of costs, and for every subsequent offence forfeit and pay for every such wild bird in respect of which an offence is committed a sum of money not exceeding five shillings, in addition to the costs,

unless such person shall prove that the said wild bird was either killed or taken or bought or received during the period in which such wild bird could be legally killed or taken, or from some person residing out of the United Kingdom. This section shall not apply to the owner and occupier of any land, or to any person authorised by the owner or occupier of any land, killing or taking on such land any wild bird not included in the schedule hereto annexed.

4. Where any person shall be found offending against this Act, it shall be lawful for any person to require the person so offending to give his Christian name, surname, and place of abode, and in case the person so offending shall, after being so required, refuse to give his real name or place of abode, or give an untrue name or place of abode, he shall be liable on being convicted of any such offence to forfeit and pay, in addition to the penalties imposed by section three, such sum of money not exceeding ten shillings sterling as to the justices or sheriff shall seem meet.

5. All offences under this Act may be prosecuted, and penalties and forfeitures under this Act recovered,—

(1.) In England in manner provided by the Summary Jurisdiction (England) Acts; and

(2.) In Scotland before the sheriff in manner provided by the Summary Procedure Act, 1864, and any Acts amending the same; and

(3.) In Ireland within the police district of Dublin metropolis, in manner provided by the Acts regulating the powers and duties of justices of the peace for such district or of the police of such district, and elsewhere in Ireland before two justices in manner provided by the Petty Sessions (Ireland) Act, 1851, and any Act amending the same.

6. All offences mentioned in this Act which shall be committed within the jurisdiction of the Admiralty shall be deemed to be offences of the same nature and liable to the same punishments as if they had been committed upon any land in the United Kingdom, and may be dealt with, inquired of, tried, and determined in any county or place in the United Kingdom in which the offender shall be apprehended or be in custody or be summoned, in the same manner in all respects as if such offences had been

actually committed in that county or place; and in any information or conviction for any such offence, the offence may be averred to have been committed "on the high seas." And in Scotland any offence committed against this Act on the sea coast or at sea beyond the ordinary jurisdiction of any sheriff, justice or justices of the peace, shall be held to have been committed in any county abutting on such sea coast or adjoining such sea, and may be tried and punished accordingly.

Where any offence under this Act is committed in or upon any waters forming the boundary between any two counties, districts of quarter sessions, or petty sessions, such offence may be prosecuted before any justices of the peace or sheriff in either of such counties or districts.

7. This Act shall come into operation on the first day of January one thousand eight hundred and eighty-one, and on the same day the Act passed in the session of Parliament holden in the thirty-second and thirty-third years of the reign of Her present Majesty, entitled "An Act for the preservation of Sea Birds," and the Act passed in the session of Parliament holden in the thirty-fifth and thirty-sixth years of the reign of Her present Majesty, entitled "An Act for the protection of certain wild birds during the breeding season," and the Act passed in the session of Parliament holden in the thirty-ninth and fortieth years of the reign of Her present Majesty, entitled "An Act for the preservation of Wild Fowl," shall be repealed.

8. One of Her Majesty's Principal Secretaries of State as to Great Britain, and the Lord Lieutenant as to Ireland, may, upon application of the justices in quarter sessions assembled of any county, by order extend or vary the time during which the killing and taking of wild birds or any of them is prohibited by this Act; after the making of which order the penalties imposed by this Act in respect of such wild birds shall in such county apply only to offences committed during the time specified in such order; and the order for the extension or variation of such time shall be published, if made by the Secretary of State, in the London Gazette, or if made by the Lord Lieutenant, in the Dublin Gazette, and a copy of the London Gazette or Dublin Gazette containing any order made under this Act shall be evidence of the same having been made.

9. The operation of this Act shall not extend to the Island of Saint Kilda, and it shall be lawful for one of Her Majesty's

Principal Secretaries of State as to Great Britain, and for the Lord Lieutenant as to Ireland, where it shall appear desirable, from time to time, upon the application of the justices in quarter sessions assembled in any county, to exempt any such county or part or parts thereof, as to all or any wild birds, from the operation of this Act; and every such order shall be published and may be proved in the manner provided in the preceding section.

SCHEDULE.

American Quail.
Auk.
Avocet.
Bee-eater.
Bittern.
Bonxie.
Colin.
Cornish Chough.
Coulterneb.
Cuckoo.
Curlew.
Diver.
Dotterel.
Dunbird.
Dunlin.
Eider Duck.
Fern Owl.
Fulmar.
Gannet.
Goatsucker.
Godwit.
Goldfinch.
Grebe.
Greenshank.
Guillemot.
Gull (except Black-backed Gull).
Hoopoe.
Kingfisher.
Kittiwake.
Lapwing.
Loon.
Mallard.
Marrot.
Merganser.
Murre.
Night-hawk.
Nightjar.
Nightingale.
Oriole.
Owl.
Ox-bird.
Oystercatcher.
Peewit.
Petrel.
Phalarope.
Plover.
Plover's-page.
Pochard.
Puffin.
Purre.
Razorbill.
Redshank.
Reeve or Ruff.
Roller.
Sanderling.
Sandpiper.
Scout.
Sea-lark.
Sea-mew.
Sea-parrot.
Sea-swallow.
Shearwater.
Shelldrake.
Shoveller.
Skua.
Smew.
Snipe.
Solan Goose.
Spoonbill.
Stint.
Stone Curlew.
Stonehatch.
Summer Snipe.
Tarrock.
Teal.
Tern.
Thick-knee.
Tystey.
Whaup.
Whimbrel.
Widgeon.
Wild Duck.
Willock.
Woodcock.
Woodpecker.

OCCASIONAL NOTES.

The Domestication of Deer.—A very interesting correspondence is published in 'The American Naturalist' for June between Mr. Brown, the Superintendent of the Philadelphia Zoological Gardens, and Mr. J. D. Caton. It relates chiefly to the domestication of species of deer. Of the twelve species kept in the Philadelphia Gardens the Mule-deer, *Cervus macrotis*, bred during 1878 and 1879; of five fawns one died when two days old; the other four, though most carefully nursed and fed with astringent food, as well as supplied with iron water and gentian powders, &c., all died of a diarrhœa caused by malignant disease. Five specimens of Moose-deer and eight of Caribou died at periods varying from three months to two years and five months in the Moose and not beyond nine months in the Caribou from hypertrophy of the heart. The Pronghorn, *A. americana*, all died speedily from diarrhœa or hypertrophy of the heart; change of food and tonics seemed to have no effect upon them. Of ten or twelve individuals none lived more than fifteen months. The Wapiti and common deer, *C. virginianus*, however, have done well, and several fawns were raised of *C. campestris*, *C. aristotelis* and *C. dama*. Of *C. leucurus* the Gardens possessed but a single specimen. In the case of the Mule-deer, Mr. Brown is disposed to account for the mortality by the difficulty of supplying them with a sufficient amount of their proper (arboreal) food, which has to be replaced by dry food and grass. Mr. Caton, writing from Ottawa, Illinois, states that he has lost the last of his stock of Mule-deer and also of *C. columbianus*, and that he is satisfied that they cannot be successfully domesticated in his grounds. He concludes that they get at something which does not agree with them; indeed all his experiments with ruminants, *feræ naturæ* whose natural habitat is confined to the United States west of the Missouri River, have proved failures. Mr. Caton has succeeded well in hybridising the Virginian deer with the Ceylon deer and the Acapulco deer. The hybrids seem to be perfectly healthy and prolific, several of the hybrids from the Virginian deer and Acapulco buck having borne perfectly healthy twin fawns. On some of the hybrids the metatarsal gland is wanting, and on some it is present, while some have it on one hind leg and not on the other.

Enforced destruction of Rabbits in New Zealand.—As an instance of the enormous increase of Rabbits in some parts of New Zealand, more particularly in one of the up-country districts of Otago Province, a recent number of the 'Tuapeka Times' gives the following statistics:—On a single day no less than 40,000 skins were brought from Messrs. Strode and Fraser's station at Earnscleugh to the railway-station at Clyde, there to be despatched to Port Chalmers for shipment to the London market. On this one estate eighteen poisoners are employed, while six men with pack-horses (known as "packers") are engaged in conducting traffic between the home station and the rabbiters' camp in the ranges, carrying out poisoned wheat and necessary supplies, and returning with the rabbit-skins. Two men and a clerk find full employment at the station in making up poisoned wheat, and fixing up and despatching the bales. A waggoner is engaged in conveying wheat to the home station, and bales of skins from there to Lawrence. Some days ago he brought down 22,000 skins; on Monday, as we have said, he had 40,000, and at the station, when he left it, there were other 40,000 in readiness to be despatched to the railway; and still there are no symptoms of the traffic diminishing. Messrs. Strode and Fraser supply the rabbiters with poisoned grain at the rate of 8s. per 100 lbs., and purchase the rabbit-skins at 2d. each. The men are earning from 20s. to 30s. a-day, and more men would be taken on but cannot be had. Some of the so-called "unemployed" were offered work, but declined it, preferring their chance of loafing on the industrious along the road. While these particulars refer to Earnscleugh Station, it is only fair to mention that the other runholders are pursuing similar measures in concert, and by arrangement arrived at in public meeting. The poison does not seem to be taken by the sheep. Although the country "stinks with rabbits," yet the tide appears to have fairly turned; already in many places where the grass was formerly devoured down to the roots, it has again resumed its verdant hue, and forms good pasture for the sheep. As an instance of what other runholders are doing, we may note that Messrs. Cargill and Anderson have six men employed, who are working their run, and making a "fine clean job of it." Their men are said to be earning 20s. to 25s. a-day each. The work of destruction is calculated to last for the next six months; and this is another inducement to men who really want work and cannot find it to inquire for themselves "whether these things are so."

The Beaver in Norway.—In a foot-note to Mr. A. H. Cocks' interesting article under this heading in 'The Zoologist' for June last reference was made (p. 234) to some remarks on the subject to be found in Bowden's 'Naturalist in Norway' (1869). Not having the book by me at the time I was unable to quote it, but have since found the passage referred to (p. 73), which runs as follows:—"The Beaver was formerly very common in Norway, and was principally found in Soloer, Österdalen, Gudbrandsdalen, and Jemteland; there is still a Bœver-dalen and a Bœver-elo, or river, in Österdalen. It is now only to be met with on the estate of a Mr. Aall, a gentleman who resides near Arendal, in the South of Norway."—J. E. Harting.

Porpoises chasing Mackarel.—On July 31st I was on the Point watching a shoal of Mackarel coming out of Pra Sand, and leisurely going due west up the current of the tide, playing on the surface. They had passed about half-way across the bay, and were about a mile from the sand, when a school of Porpoises (*Delphis delphinus*), over thirty in number, came up leisurely from the southward into the sand. After awhile they came across the track of the Mackarel, and a curious change took place. The whole school turned westward at once, and gave chase at racing speed after the Mackarel. In less than five minutes the Porpoises were in the midst of the Mackarel, and a very lively scene ensued. The Mackarel rushed violently forward on the surface of the water, raising a white wave. Hundreds of fish were constantly leaping feet high out of the water at the same time, and all the while the black backs of the Porpoises, going in and out and backwards and forwards through their ranks, showed where they were dealing havoc. Thus engaged they passed out of sight round another point of land. I feel satisfied that the Porpoises could not have sighted the Mackarel when they turned to give chase, and therefore take it for granted they must have scented them.—Thomas Cornish (Prussia Cove, Marazion).

Solitary Snipe in Northamptonshire.—A specimen of the Great or Solitary Snipe, *Scolopax major*, was shot yesterday (Sept. 13th) in a meadow on the Nén near Thorpe Waterville, by my friend and neighbour, Mr. George E. Hunt, of Wadenhoe House, who brought the bird to me; it weighs a little over seven ounces and three-quarters, and is a mass of fat. This is the first of this species which has been obtained in this neighbourhood in my recollection, though I saw one many years ago on a dry bean-stubble whilst I was loading my gun after firing both barrels at Partridges, and in spite of an hour's close search could not flush it again. Mr. Hunt, above mentioned, shot a bird very near the spot where he killed this Great Snipe, but he could not recover it; this was about this time of year some two or three years ago. I may mention that several persons have informed me of their having seen Solitary Snipes in this part of our county; but, in the majority of instances, these birds have proved on investigation to be Green Sandpipers, *Totanus ochropus*, a common summer visitor to our streams and ponds. The heavy rains in July and the early part of August of the present year brought an unusual number of Common Snipes, Peewits, a few Curlews, and some Teal up our river valley; and two Spotted Crakes, *Crex porzana*, an uncommon species with us, were shot by Mr. Hunt on August 19th in the meadow in which he killed the Great Snipe yesterday.—Lilford (Lilford Hall, Oundle).

Nidification of the Reed Warbler.—Mr. Seebohm's remarks on the Reed and Marsh Warblers, in last month's 'Zoologist' (p. 377) suggest to me that the following notes on the nesting of the former species may be interesting to ornithologists. Just outside the borough of Leeds, and in close proximity to the banks of a canal, the smell of whose water is very offensive to the olfactory nerves, is a small narrow willow garth, separated from the towing-path for its entire length by an open drain, about four feet in width, which carries the sewage of two extensive townships, and the odour from which is simply pestilential and pervades the entire plantation. The willows are planted very close together, and are tall and slender, the undergrowth being almost entirely rank nettles. Here, taking into consideration the extent of the place, the Reed Warbler is abundant, though as a Yorkshire bird it must be considered both rare and local. On the 12th or 13th of June last I found seven nests of this bird, containing eggs, in a few minutes; four of these were in the willows, being placed against the slender bole and supported by having two or three twigs passing through their structure. The minimum height from the ground of the nests so placed was five feet, the maximum seven feet six inches. Other nests were hidden among the nettles and supported by their stems and dead twigs of the willows. One nest was sustained by three nettle-stems. These nests were about two feet from the ground. The nests were typical in structure and composition, but I noticed that some of them were spangled with a whitish vegetable skin, probably obtained from the willow-buds. The eggs were mostly four in number, in one instance five, and the contents of two of the nests were exactly similar to the eggs of the Marsh Warbler described by Mr. Seebohm, the ground colour being white with markings, principally at the larger end, and of a clear greenish grey tint of varying intensity. These eggs were so very unlike the ordinary type, and at the same time so different to those of any other bird that I remarked to the friend who accompanied me that had it not been for the fact of our having seen them in the nest it would have been an impossibility to have assigned them to any species known to us.—W. EAGLE CLARKE (5, East View, Hyde Park, Leeds).

NESTING OF MONTAGU'S HARRIER.—In reply to Capt. Hadfield's remarks upon my note on the nesting of Montagu's Harrier near York, I may observe that the egg has been examined by some of our best Yorkshire ornithologists, and they pronounce it to be undoubtedly the egg of *Circus Montagui.* I have a fine series of Harrier's eggs in my collection, and I invariably find that there are three distinct sizes. Those of the Marsh Harrier are largest, then come those of the Hen Harrier, the smallest being those of Montagu's Harrier. Now the egg in question is a little smaller than several of my Montagu's Harrier eggs; it is too small for that of the Hen Harrier, though in the case of Harriers, Owls, Ducks, &c., the best way of identifying the eggs is by obtaining the bird. Mr. Widdas's description of the bird is that of a female *Circus Montagui.* In this part of Yorkshire the Hen

Harrier is quite as rare as either Montagu's or the Marsh Harrier. With regard to the nest being composed of different materials to the one found by Mr. Howard Saunders in the Isle of Wight, I think that may be easily accounted for: perhaps heath and ferns were more easily obtained on the downs where Mr. Saunders found his nest; and with regard to the one described by me, which was found on marshy ground, it is very probable that rushes and other aquatic plants were to be obtained more easily than heath and ferns. I think I am right in saying that the nest of Montagu's Harrier is found built above the ground as often as that of the Hen Harrier. In several works I have by me it is stated that the nests of both species are sometimes found in or near whin bushes. The reason Mr. Widdas took the single egg, thus causing the bird to forsake the nest, was on account of the gamekeeper, who destroys all hawks and hawks' nests and eggs whenever he meets with them. I only know of one other instance of this Harrier breeding in Yorkshire, and that is recorded by Mr. Butterfield in 'The Zoologist' for 1879 (p. 220). I am always very careful not to jump to conclusions hastily, but I think I may safely say it was Montagu's Harrier that bred at Stockton-on-Forest, and not the Hen Harrier, as conjectured by Capt. Hadfield. Since replying as above to Capt. Hadfield's remarks, I have seen Mr. Widdas, who says that "neither moss nor hair was included in the materials used for building the nest." On referring to my note-book I find that moss and hair are mentioned, but this must be a mistake, as the only materials used were rushes, flags, grass, &c.—Walter Raine (Leeds).

On the Cry of the White Owl.—The interesting observations by the Rev. A. Matthews on the cry of the White Owls so exactly agree with mine that I should like to add my testimony to his, as regards the improbability of this bird ever hooting like the Brown Owl. In my boyhood I had quite as good opportunities as Mr. Matthews for becoming familiar with the cry of the White Owl, for when residing at Castle Warren, Co. Cork, where these Owls were common, a pair bred every season in a disused chimney of the old castle part of the building, and the only call ever heard from the old birds was the loud discordant screech emitted by them when in flight, as well as when seen standing on the chimney or other parts of the building. Since I have come to reside in this part of the country, where the White Owl is also common, building in the old ruins of Castleconnor and of the Abbeys of Roserk and Moyne, it has come under my notice every season, and is frequently seen here in the summer evenings beating about the lawn, yet we have never heard any call proceeding from these birds save the usual harsh-sounding screech. As additional evidence against the probability of the White Owl hooting (at least, in Ireland), I may give the experience of my friend Capt. W. K. Dover, of Myrtle Grove, Keswick, who was well acquainted with the Brown Owl in its native haunts in Cumberland, and so familiar with its cry that he has got it to reply to his good imitation of its hooting; yet, during his long residence in various parts of Ireland, has never heard any sound proceeding from White Owls at all resembling the well-known and peculiar "hoot" of the Brown Owl. In conclusion, I may remark that if White Owls were capable of hooting, such a very peculiar cry would at once attract the attention of observers in those localities where nothing but the "screech" of the White and the "moan" of the Long-eared Owls had previously been known. — ROBERT WARREN (Moyview, Ballina).

AVERAGE DATE OF ARRIVAL OF THE CUCKOO IN ENGLAND.—In your notice of the recent number of Prof. Newton's edition of Yarrell's 'British Birds,' you quote a foot-note, from p. 389, in which Prof. Newton, with his usual caution, speaks of the reported early arrivals of the Cuckoo in this country as to be received with "suspicion, if not incredulity." He then refers to a communication to 'The Zoologist' (p. 3115), in which Mr. Harper says that a Cuckoo's egg was taken in Norfolk on April 5th, 1851. I have not 'The Zoologist' at hand, but in a similar communication to Morris's 'Naturalist' (vol. i., p. 91), Mr. Harper does not claim to have seen the egg in question, but merely remarks that "a lad living in the hamlet of Lakenham obtained from the nest of a Hedge Accentor the egg of a Cuckoo"—a statement which he fails to support by any observation of his own, and which, without further particulars, I for one should be inclined to accept with "suspicion, if not incredulity." As Mr. Harper killed the Cuckoo with the egg in its mouth on the 14th of this same month and year, it may be worth stating that the earliest date under the head "Cuckoo sings" in the "Indications of Spring" kept by the Marsham family at Stratton Strawless, also near this city, occurs in the year 1752, *viz.*, April 9th; the latest being May 9th, in the years 1767 and 1769; and the mean of 112 years, April 23rd. The date for the year in question (1851) is April 22nd.—THOMAS SOUTHWELL (Norwich).

SPOTTED WOODPECKER NEAR BANBURY.—I am pleased to say that there is very little doubt but that both *Picus major* and *P. minor* have bred in this district this season. On July 17th an immature specimen of the former (a female) was shot at Overthorpe, Northants, and on the 22nd of the same month an immature male at Farnborough, Warwickshire. *P. minor*, also a bird of the year, was killed at Bodicote on the 2nd. It is to be regretted that these were destroyed, but the rest of the hatches may have escaped. One or two of the latter are generally seen in this parish in the course of the year.—OLIVER V. APLIN (Bodicote, near Banbury).

[We do not regard the fact of young birds having been shot towards the end of July as affording proof of their having been bred in the neighbourhood where they were obtained.—ED.]

PIED FLYCATCHER AT THE LIZARD.—On September 8th I saw a Pied Flycatcher, *Muscicapa atricapilla*, which at once arrested my attention, and after a short time I succeeded in shooting it. On the 10th I killed another, a very good specimen. I have sent both to Mr. Vingoe, of Penzance, for preservation. Rodd, in his 'Birds of Cornwall,' p. 26, says:—"It first came under my notice in 1849, when one was captured in the autumn at Alverton, Penzance. Since then others have been met with at Scilly also during the winter months. It is here included only as a rare autumn straggler."—HERBERT PASSINGHAM-HART (Polbrean, The Lizard).

THE DEPARTING SWALLOWS.—German newspapers remark that the migratory birds have this year commenced their journey southwards earlier than usual. An old German proverb assigns the 8th of September for the beginning of the Swallow's exit. But already, by August 10th, it was observed all over North-Western Germany that those of the House Swallows whose broods were fully fledged were visibly preparing for their flight; most of the other Swallows had already preceded them. On August 21th a large flock of Storks coming from the north-west arrived in Berlin, visibly tired by a long flight, and continued their journey towards the south-east.—*Norwich Mercury* (*September 8th*).

DIPPER RETURNING TO ITS OLD NEST.—In 'The Zoologist' for last month (p. 406) is a note on the Dipper returning two years in succession to the same nest. Would Mr. Jesse allow me to inform him that in North-West Yorkshire, where the Dipper is common on most of our mountain streams, it is not unusual for the Dipper to return year after year to the same nest? I have been informed of a pair that have repaired and made use of the same nest for many years in succession. So attached is this bird to some favourite spots that it will return to the same nest even if its eggs or young are taken. I have also found this to be the case with the Kingfisher. Mr. Roberts, of Scarborough, gives an account of a Kingfisher returning to its nest after being robbed of its eggs three times in succession in one season ('Naturalist,' 1880, p. 154). In fact, a great many birds, if not disturbed, will return year after year to repair their old nests and rear their young.—WALTER RAINE (Leeds).

EARLY ARRIVAL OF WIDGEON IN THE MOY ESTUARY.—On the 2nd September, when going to Bartragh with some friends, we observed a little flock of seven or eight Widgeon, and on the 6th upwards of twenty were seen. This is an unusually early date for the appearance of Widgeon in this locality.—ROBERT WARREN (Moyview, Ballina).

LESSER GREY MULLET ON THE NORTHUMBERLAND COAST.—By the kindness of Mr. J. de Camborne Paynter I have received a fish, in a gutted and salted condition, captured at Alnmouth, on the Northumberland coast, which is undoubtedly a *Mugil*, and which I judge to be the Lesser Grey Mullet, *Mugil chelo* of Yarrell and Couch. It was unknown to the local fishermen. It is twenty inches over all, and sixteen inches from eye to fork, but I cannot give any other measurements. It agrees in all its remaining aspects with the description given by Yarrell, except in the following:—The nostrils in my specimen are wide apart. The anal fin appears to have only one spinous ray, instead of three; the caudal appears to have eighteen rays, instead of sixteen. There is in my specimen a hard leathery double tubercle in the palate without teeth, which may have become fleshy and hardened by the process of salting. I do not recollect having ever seen this Mullet before, and certainly never of such a size; but its principal features of breadth of head, dentition, peculiarities of its superior maxillary bone, size of scale, and arrangement of seven marked horizontal lines along its sides, make me believe very strongly that I am not mistaken in my identification. — THOMAS CORNISH (Prussia Cove, Marazion).

THE MAIGRE, OR SHADE-FISH, OFF THE DEVONSHIRE COAST.—I received a specimen of this rare fish on August 30th from a fish-merchant at Beer, it having been taken by the Beer fishermen in a pollack-net. It measured 2 feet 8¼ inches in length, and 1 foot 4¾ inches in girth over the pectoral fins. The colour was plain grey, and the general appearance was very much like that of a Bass. On dissection I could find no trace of the small hand-like appendages which usually fringe the thick leathery swimming-bladder. The stomach was empty. There were a number of finger-like appendages. The gill-covers were very slightly serrated. The anterior pharyngeal bones were armed with conical scabrid projections in two rows. This is the second specimen I have had an opportunity of examining. The first was taken off Teignmouth in a pilchard-seine on October 3rd, 1872, and measured 5 feet and ½ an inch in length, and 2 feet 10 inches in girth over the pectoral fins. Its weight was 74 lbs. Adhering to the scales I found several specimens of the Holibut Leech, *Entobdella hippoglossi*. In its stomach were six Monkfish (each about a foot in length), six small Pilchards, and a small Sole. Some of the flesh was cooked and found very palatable, much resembling Mackarel in flavour.—W. S. M. D'URBAN (Albert Memorial Museum, Exeter).

ECKSTROM'S TOPKNOT AND COUCH'S ERYTHRINUS ON THE CORNWALL COAST.—On August 26th in Pra Sand, on "splatty" ground (*i. e.*, ground of which the base is sand, over which are scattered numerous detached rocks covered with sea-weed), I took a specimen of Eckstrom's Topknot, *Rhombus cardina*, I believe the first recorded as captured in Mount's Bay. As it was alive when taken, I am able to say that the gape is not wide, as asserted by Couch ('British Fishes,' vol. iii. p. 175), who may have been misled by some relaxation of the muscles caused by death. The mouth, in fact, is a small one. At the same time and place I took a small specimen of Couch's Erythrinus, *Pagellus erythrinus*. I shall be glad of correction if I am wrong, but the more I see of this fish the more convinced I am that it and Couch's Spanish Bream ('British Fishes,' vol. i. p. 235) are the same species in different stages of growth. There is much more difference between a Chad (or young Bream) and a full-grown Bream than there is between *Erythrinus* and the Spanish Bream as figured by Couch, and as seen by me.—THOMAS CORNISH (Prussia Cove, Marazion).

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ENTOMOLOGICAL SOCIETY OF LONDON.

July 7, 1880.—J. W. DUNNING, M.A., F.L.S., Vice-President, in the chair.

Mr. Jenner Weir exhibited, on behalf of Mr. J. W. Douglas, a worn female specimen of *Noctua C-nigrum*, which had been taken on June 27th.

Mr. M'Lachlan exhibited a piece of sugar-cane from Queensland much damaged by some Lepidopterous larva, of which specimens were also exhibited. Without having the moth, it would be impossible to decide with any certainty as to the species; but, judging from the larva, he was inclined to believe that it was a species of *Pyralis*. On consulting with Miss Ormerod, he had come to the conclusion that the species was not the same as the "cane-borer" from British Guiana.

Mr. W. L. Distant said that he was acquainted with the "cane-borer" from Madras, and that it was not the same species as that described by Guilding.

Mr. W. F. Kirby called attention to the description and figure of *Pyralis saccharalis*, Fabr., published in 'Skifter af Naturhistoric Selskabet,' vol. iii. part 2 (1794), pp. 63–65, pl. vii. fig. 1, where the insect is represented in all stages. He also referred to the long account of the insect given by Guenée in Maillard's 'Notes sur l'Ile de Réunion,' Lép., pp. 68–71. Guénée considers the insect to be allied to *Schœnobius*, and calls it *Borer* (!) *saccharellus*. Fortunately this generic name will not stand, as Guilding's name of *Diatræa* has the priority.

Miss E. A. Ormerod exhibited specimens of *Tomarus bituberculatus*, *Sphenophorus sacchari* (with cocoon), and *Rhyncophorus* (? *palmarum*, cocoons and pupa), and read the following note on "Cane-borers":—

"In the course of last autumn it was mentioned to me that, in addition to the species of cane-borer previously noticed, another kind (which was incidentally mentioned to be a *Macraspis*) was doing much harm in Berbice. On examination of the specimens, however (now exhibited), the beetle turned out to be one of the Dynastidæ, *Tomarus bituberculatus*, and any suggestion for diminishing the numbers would be very acceptable. The beetle, which is one of the kinds popularly known as 'hardbacks' in the colony, is enormously plentiful, coming into the houses in the evening in such quantities as to require to be swept from the tables, and I am informed by a naturalist lately resident in Guiana that as many as five specimens may be found in the unopened flower-buds of the *Victoria Regia*.

"The other specimens exhibited are of *Sphenophorus sacchari*, with its cocoon, and also two cocoons (one opened to show the contained pupa) of a larger species of *Rhyncophorus*, but I conjecture not of *Rhyncophorus palmarum*. In the course of investigation last year it appeared that there were more species at work than was at first supposed. One of these, kindly lent me for examination by the Colonial Company, much resembles *R. palmarum*, but is smaller, and, after careful search and comparison of specimens,—in which I was kindly assisted at the British Museum,—appears to be undescribed. It is very like *R. Zimmermanni*, but is not identical. A very few specimens, bred by Mr. D'Urban, of Exeter, from imported canes, appear to be of yet another species, but I only know these by report.

"Larvæ of the large *Rhyncophorus*, and of the *Sphenophorus sacchari*, have been exhibited before; but I show them now relatively to a peculiar formation frequently noticeable in the larger grub,—of which some lumps will be noticed at the bottom of the bottle (this is whitish and hard when in the grub preserved in spirits),—and I benefit by the examination kindly made of it by Mr. Meldola to mention that it is of the nature of a true wax, and may be derived from *cerosin*, a natural wax found in sugar-cane, investigated by Avequin and Dumas, and here conjecturally altered by the digestive processes. The taste of this secretion (which perhaps I should mention was, after some preliminaries, *my* part of the experiment) was exceedingly sweet, and throws some light on the fondness of the natives, and also in some cases of the residents, for these grubs, as matter of food. I am informed they are partaken of fried or 'plain boiled,' and all mashed up together, and as many as 120 are eaten at a sitting! As this formation of sugar melts at a very low temperature, probably the operation of cooking disperses its sweetness through the mass; nevertheless the dish appears somewhat uninviting.

"To return, however, to the attacks of the cane-borer in Demerara; these were lessened for a time, but are still in action to a much greater extent than could be wished. Many experiments have been tried, and amongst others it is noted with regard to powers of endurance that it required 10 parts of sulphuric acid to 100 of water to kill the small borer

(*Proceras*), and 30 parts acid to 100 of water to kill the large kind—locally the 'tácuma,' scientifically the *Rhyncophorus*. The application of chemicals is, however, scarcely practicable. From the size and extent of the crop, and the fact of the borers being inside when at work, it is very hard to get at them, but nevertheless systematic care seems to be doing something.

"The points that appear especially to be attended to beneficially are, first, with regard to what are termed 'tops,' that is, the long pieces of cane-cuttings put in to form the new plants. These are carefully watched, and, if symptoms of the borer appears, are removed. Another point is cutting out infested pieces from the crop-plants; in this way the insect presence is diminished, and by putting the removed cane through the mills enough is got from it to pay expenses. Attention is also directed to destroying refuse cane, which otherwise would accumulate, and, by attracting borers, form centres for new hordes to come out from.

"These points are all of great importance, and can be worked practically; but for the constant watch on the borers necessary to keep them down, it seems that the only sure protection lies in encouragement of their natural enemies, and especially the ants, which form a kind of insect police, constantly and very efficiently on the look-out.

"After discussion of the subject last year (following on the very judicious suggestions of some of the residents in the colony), the Colonial Company issued orders that no more ants' nests should be burned. These natural protectors require some special care themselves, as, in addition to the clearing of their nests by fire in process of cultivation, it is a custom to burn them in order to drive away mosquitoes by the peculiarly pungent and unpleasant smell thus produced.

"This protection, it may be hoped, will bring the average ant presence up to the previous amount, for there seems no doubt of their usefulness. I am informed by various residents (with whom I have been in communication whilst they were in England) that when unchecked these ants are immensely numerous; to be found in nests at the foot of the cane, and also on the canes; and that if some pieces of the cane are thrown down ants will directly be seen streaming to them from all quarters; and in this way they are always at hand to attack the eggs or young grubs before they have made their way into the cane, or again on their exit from it before going into the pupal state. They appear to me the only check applicable to the cane-borer moth, *Proceras sacchariphagus*, in its imago form, in which, from the observations made in Mauritius, it appears to be remarkable for its sedentary habits, remaining motionless for a large portion of its short life in the shelter of the leaves.

"The life-history of the moth has been already given by various writers, but there is so much of interest in the very long notes of it given by Mr. W. Bojer, the President of the Committee appointed by the Governor of the Island of Mauritius to investigate the subject and suggest a remedy, in the autumn of 1848, on the first outburst of the alarm, when the moth was found to have fairly made good its footing in Mauritius, that, as the original documents are somewhat difficult of access, and the numbers of the 'Sugar-Cane' and the 'Royal Gazette,' in which they are reprinted, appear to be almost equally so, I venture to give some points from the Report.

"It appears that the presence of this moth was not known in Mauritius, either by any planter, or by any naturalist familiar with the local Entomology, until November, 1848, when, with a view to regenerate the canes of the islands (then diseased in another way), a quantity of new canes were sent for from Ceylon. Before the arrival of these canes a report was circulated that Cingalese canes were infested by a borer. On their arrival examination was made by a Committee appointed for the purpose, and almost all these newly-imported canes were found to be perforated by the moth cane-borer. The immediate destruction of the canes was recommended, but it is conjectured that some left temporarily in an accessible spot were carried off and planted, for two years afterwards the moth made its appearance.

"The notes from Mauritius agree with most of those from British Guiana as to the moth-egg being laid on the cane-leaves; the caterpillar feeding in the cane, and subsequently coming out again and turning to pupa in a slight web amongst the leaves. The eggs are stated to be transparent, their greenish colour making them difficult of observation on the cane-leaf; their shape is depressed and oval; their longest diameter is stated to be the third of a line.

"The only moth observed in the act of oviposition deposited 162 eggs, which were placed in two parallel rows and hatched on the ninth day. Their extreme transparency allowed of observations of the development of the caterpillar in the egg. On the second day an opaque line was noticed, indicating the first appearance of the digestive organs. On the next day a small black point at one extremity of the line indicated the future head; later the body of the insect became more apparent; movement became visible, and its position is stated to have been coiled on itself with the head in the centre. The length of the caterpillar on coming out of the egg on the ninth day is given as 1¼ line.

"When the caterpillar has reached full development, which is at the end of about thirty-one days, it is 12 to 14 lines in length, and its movement is described as being very quick in either direction, whether forward or backward. The head is depressed, furnished with strong toothed jaws, and with a plate of a paler colour. The labrum is said to have a very hard lance-shaped termination, which helps it to perforate the cane.

"'Each segment has four black glands in a longitudinal row on each side of the back marked by a pink band. On the lateral sides are also seen eight black points surrounded by glands of the same colour, united also by a pink band.' These points are the breathing pores. The glands are usually terminated by bristles.

"The caterpillar changes its skin five times before metamorphosis, and when about to turn it leaves the inside of the cane and lightly spins a few of the leaves together for a protection. The caterpillars that from any cause remain to undergo pupation in the cane appear usually to perish from the humidity and unsuitableness of position, or from *Acari*. Several hundred chrysalides taken from inside cane were found on inspection to contain *Acari* instead of the future moth.

"The existence of the insect is computed at nine days in the egg, thirty-one as a caterpillar, fifteen as a chrysalis, and four or five in the imago state—about sixty days altogether; and as in the mildness of the Mauritian climate reproduction takes place at all seasons, the increase is very rapid.

"Details regarding these small moths have been so fully given elsewhere that I need not enter on their specific description, but their appearance when in repose is stated to be very singular. The inferior palpi are stated to be nearly three times the length of the head, projecting forward in the shape of a beak. The anterior legs are without spines, and when the moth is at rest are directed forward parallel to the beak-like palpi, and in addition to the great black eyes which distinguish this moth, and the antennæ laid flat against the wings, which they exceed in length (but which are raised at a right angle when on the point of flying), are remarked as giving the insect 'a very peculiar, not to say sinister look.'

"From observations made on the moth in captivity, it is stated to be very sedentary in its habits, remaining fixed in the same place for thirty-six hours concealed between leaves without even changing its position. Its flight is heavy and almost vertical; but when tormented at night by a vivid light, it jumps and turns on itself very quickly, and if set at liberty—far from being attracted by the light of a candle—conceals itself in the darkest corner of the room. The writer observes, 'This peculiarity has confirmed us in our first impression that its large eyes are totally deprived of the choroid membrane, which renders it almost blind.' It is also noted that the moth had not then been captured in the cane-fields—conjecturally from its remaining hidden under the leaves.

"The report quoted runs to considerable length, but I have given these few points as they seem of practical importance.

"The habits as mentioned agree with those noted of the moth cane-borer from Demerara, even in the matter of difficulty of capture, and this quiescent state in the shelter of the leaves and immediate concealment on disturbance, puts it on the one hand almost *out* of reach of destruction by the usual artificial means of attraction; and, on the other hand, puts it very much *into* the power of the ants, stealing quietly into every nook to lay hold of and destroy it.

"Effects of weather and state of health of the plants appear to act strongly on the borers generally, the attacks being noted as worst in seasons of drought; this, apparently (as with some of our English attacks), from the dry weather, and state of the plant-juices being favourable to the insects, and also from the plants not being able to make way against them, or 'grow past,' as it is termed.

"This point is worth notice, relatively to what may be found to answer from increased irrigation or anything keeping up the vigour of the plant as stimulant application; and I may observe that in an experiment instituted with regard to the effects of the mixture known as 'Soluble Phenyle,' this was applied in diluted form with ash of the burnt canes, and whether from the ash or the 'phenyle,' or both, a growth was reported of a remarkably healthy green, and although the difference in amount of insect presence accompanying was not great, it was certainly less."

Mr. W. L. Distant stated that he had had some experience in sugar-cane growing in Malacca, and he was of opinion that the remedy for exterminating the borers lay with the planters themselves. The necessity was to burn all the refuse "trash" from the canes, as was done on the largest estates, and not allow such to accumulate, as frequently took place on badly managed plantations. He had only that day been discussing the matter with a large cocoa-nut palm grower of Malacca. That palm suffers severely from the depredations of two beetles, *Xylotrupes gideon* and *Oryctes rhinoceros*, and the principal defence is to prevent the accumulation of vegetable refuse. Frequently Chinamen who had adjoining plantations would allow "paddy" husk, or sawdust, to accumulate, thus affording breeding grounds for these destructive insects, to the injury of all the surrounding estates.

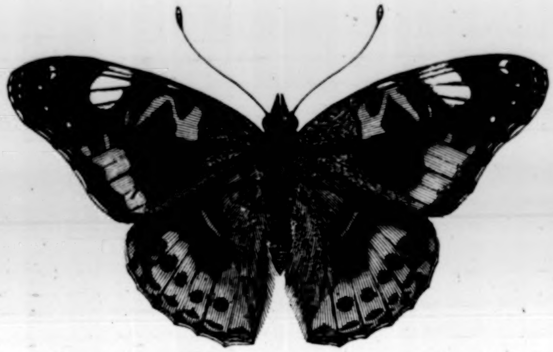
Miss Ormerod stated that the planters in British Guiana had now become aware of the importance of not allowing refuse to accumulate.

Mr. M'Lachlan was of opinion that the cane-borers could be entirely exterminated by weeding out and burning the canes as soon as they showed any symptoms of being infested.

Mr. W. L. Distant exhibited a specimen of the so-called "vegetable caterpillar" from New Zealand, procured for him by Dr. Dunkley. This is the larva of a moth, *Hepialus virescens*, on which the spores of *Cordyceps* (*Sphæria*) *Robertsii* frequently fall, becoming truly vegetable parasites, destroying the caterpillars, and growing therefrom in the form which has caused so many erroneous statements to be made. This caterpillar feeds on the Convolvulus (native potato).

Mr. T. R. Billups exhibited a larva of *Plusia chrysitis* and some specimens of an Ichneumon that infested it. He stated that 120 of the Ichneumons had emerged, and that he had identified them as a species of *Paxylloma*.

Mr. A. Phipson exhibited a remarkable variety of *Pyrameis cardui* taken near Basingstoke last August. (See fig.)



The Secretary then read a note by Mr. Sidney Churchill, of Teheran, on *Argas Persicus*.

Mr. R. Trimen communicated notes "On the pairing of a Butterfly with a Moth in Natal" and "On a supposed female of *Dorylus helvolus* (Linn.)."

Messrs. F. Du Cane Godman and Osbert Salvin communicated "A List of Diurnal Lepidoptera collected in the Sierra Nevada of Santa Marta, Colombia, and the vicinity."

August 4, 1880.—J. W Dunning, M.A., F.L.S., Vice-President, in the chair.

Sir Sidney Saunders forwarded for exhibition four living specimens of *Prosopis rubicola*, all stylopized females recently bred from larvæ extracted from briars received from Epirus, each of these small beetles bearing the projecting puparium of a male *Hylechthrus*, and in one instance two of the latter, and communicated some notes thereon.

Miss E. A. Ormerod exhibited a soft, fleshy gall-like formation found on *Rhododendron ferrugineum* at Merton, and believed by Dr. Thomas to be a fungoid growth.

Mr. Fitch stated he had often possessed specimens of this supposed gall, and had attempted in vain to breed an insect from them; he was therefore disposed to concur in Dr. Thomas's view.

Mr. T. R. Billups exhibited a specimen of *Heptaulacus villosus* from Box Hill.

Mr. C. O. Waterhouse stated that about five years ago he had taken from forty to fifty specimens of this rare beetle in a chalk-pit in Freshwater Bay.

Mr. H. J. Elwes communicated a paper "On the Genus *Colias*," and Mr. W. L. Distant read a paper entitled "Notes on Exotic *Rhynchota*, with descriptions of new species."—R. Meldola, *Hon. Secretary*.